

CLAIMS

What is being claimed is:

1. A method of making a light-emitting device, the method comprising:
growing a III-nitride light-emitting structure on a growth substrate, the III-nitride light-emitting structure including a p-type layer, an n-type layer, and a light-emitting layer;
wafer bonding the III-nitride light-emitting structure to a host substrate; and
after wafer bonding the III-nitride light-emitting structure to a host substrate, removing the growth substrate.
2. The method of claim 1 further comprising:
forming a first electrical contact on a side of the III-nitride light-emitting structure opposite the growth substrate;
prior to removing the growth substrate, forming a first bonding layer on the first electrical contact; and
forming a second bonding layer on the host substrate;
wherein wafer bonding the III-nitride light-emitting structure to a host substrate comprises wafer bonding the first bonding layer to the second bonding layer.
3. The method of claim 2 wherein at least one of the first bonding layer and second bonding layer is formed by a technique selected from a group including electron-beam evaporation, sputtering, and electro-plating.
4. The method of claim 2 wherein the first bonding layer is selected from a group including silver, nickel, aluminum, gold, and cobalt.
5. The method of claim 2 further comprising:
after removing the growth substrate, forming a second electrical contact on a side of the III-nitride light-emitting structure exposed by removal of the growth substrate.
6. The method of claim 5 wherein the first electrical contact is electrically connected to the p-type layer and the second electrical contact is electrically connected to the n-type layer.

7. The method of claim 2 wherein the first electrical contact comprises silver.
8. The method of claim 2 further comprising:
forming a first substrate electrical contact on a first side of the host substrate; and
forming a second substrate electrical contact on a second side of the host substrate opposite the first side;
wherein the second bonding layer is deposited on the first substrate electrical contact.
9. The method of claim 1 further comprising:
etching mesas through the III-nitride light-emitting structure, the mesas defining individual light-emitting devices; and
singulating the host substrate to form individual light-emitting devices.
10. The method of claim 9 wherein the mesas are etched after removing the growth substrate.
11. The method of claim 1 wherein the host substrate is selected from a group including metals and semiconductors.
12. The method of claim 1 wherein the host substrate is selected from a group including silicon, germanium, glass, copper, and gallium arsenide.
13. The method of claim 1 wherein removing the growth substrate comprises removing the growth substrate by a technique selected from a group including laser melting, mechanical polishing, and etching of a sacrificial layer grown on the substrate prior to growing the III-nitride light-emitting structure.
14. The method of claim 1 further comprising:
forming a first dielectric Bragg reflector mirror and a first electrical contact on a side of the III-nitride light-emitting structure opposite the growth substrate;

after removing the growth substrate, forming a second dielectric Bragg reflector mirror on a side of the III-nitride light-emitting structure exposed by removal of the growth substrate.

15. The method of claim 14 further comprising:

etching away a portion of the second dielectric Bragg reflector mirror to expose a portion of the III-nitride light-emitting structure;

forming a second electrical contact on the portion of the III-nitride light-emitting structure exposed by etching away a portion of the second dielectric Bragg reflector mirror.